

## CLAIMS

### What is claimed is:

1. A substrate assembly, comprising:  
a substrate;  
a layer of resilient conductive material disposed proximate a surface of said substrate, said layer of resilient conductive material defining a plurality of electrically isolated spring-biased electrical contacts, each electrically isolated spring-biased electrical contact having an electrically isolated conductive trace extending therefrom and further including a surface configured for biasing against and electrically contacting a lead element of an integrated circuit device.
2. The substrate assembly of claim 1, further comprising a plurality of vias disposed in said substrate, each via of said plurality of vias opening onto at least said surface of said substrate and underlying one of said plurality of electrically isolated spring-biased electrical contacts.
3. A substrate assembly, comprising:  
a substrate;  
a laminate sheet of resilient conductive material bonded said substrate proximate a surface thereof, said laminate sheet of resilient conductive material defining a plurality of electrically isolated spring-biased electrical contacts, each electrically isolated spring-biased electrical contact having an electrically isolated conductive trace extending therefrom and further including a surface configured for biasing against and electrically contacting a lead element of an integrated circuit device.

4. The substrate assembly of claim 3, further comprising a plurality of vias disposed in said substrate, each via of said plurality of vias opening onto at least said surface of said substrate and underlying one of said plurality of electrically isolated spring-biased electrical contacts.

5. A substrate assembly, comprising:  
a substrate having a first surface and an opposing second surface;  
a layer of resilient conductive material proximate at least a portion of at least one of said first and second surfaces of said substrate;  
at least one spring-biased electrical contact formed in said layer of resilient conductive material and electrically isolated from said layer of resilient conductive material by an aperture formed in said layer of resilient conductive material, said at least one spring-biased electrical contact including a surface configured for biasing against and electrically contacting a lead element extending from an integrated circuit device; and  
at least one conductive trace formed in said layer of resilient conductive material and electrically isolated from said layer of resilient conductive material by at least one cavity, said at least one conductive trace terminating at said at least one spring-biased electrical contact.

6. The substrate assembly of claim 5, further comprising at least one via extending through said substrate and disposed at a location aligned with said at least one spring-biased electrical contact.

7. The substrate assembly of claim 6, wherein said at least one via opens only onto said at least one of said first and second surfaces of said substrate.

8. The substrate assembly of claim 5, wherein said at least one spring-biased electrical contact comprises a cantilevered spring, a transversely deflecting hoop-shaped spring, a spiral-shaped spring, or a rosette spring.

9. The substrate assembly of claim 5, wherein said at least one spring-biased electrical contact is configured to at least partially align said lead element extending from said integrated circuit device relative to said at least one spring-biased electrical contact.

10. The substrate assembly of claim 5, wherein said at least one spring-biased electrical contact further includes a permanent deflection.

11. The substrate assembly of claim 5, wherein said layer of resilient conductive material comprises a laminate bonded to said at least one of said first and second surfaces of said substrate.

12. The substrate assembly of claim 5, wherein said layer of resilient conductive material comprises a layer of material deposited on said at least one of said first and second surfaces of said substrate using a deposition process.

13. The substrate assembly of claim 5, wherein said at least one spring-biased electrical contact further includes at least one contact element disposed on said surface and configured to remove or puncture through a layer of contaminants formed on an exterior surface of a lead element extending from an integrated circuit device.

14. The substrate assembly of claim 13, wherein said at least one contact element comprises a plurality of alternating grooves and ridges, a plurality of protrusions, or a roughened surface.

15. An electrical component, comprising:

- a substrate having a first surface and an opposing second surface;
- a layer of resilient conductive material disposed proximate at least a portion of said first surface of said substrate;
- a plurality of spring-biased electrical contacts formed in said layer of resilient conductive material, each spring-biased electrical contact of said plurality of spring-biased electrical contacts electrically isolated from said layer of resilient conductive material by an aperture formed in said layer of resilient conductive material;
- a plurality of conductive traces formed in said layer of resilient conductive material, at least a portion of said plurality of conductive traces each terminating at one spring-biased electrical contact of said plurality of spring-biased electrical contacts, each conductive trace of said plurality of conductive traces electrically isolated from said layer of resilient conductive material and all other conductive traces of said plurality of conductive traces by at least one cavity; and
- at least one integrated circuit device disposed on said first surface of said substrate, said plurality of spring-biased electrical contacts on said first surface of said substrate arranged in at least one array corresponding to a footprint of a plurality of lead elements extending from said at least one integrated circuit device, each lead element of said plurality of lead elements of said at least one integrated circuit device biased against and electrically contacting one spring-biased electrical contact of said plurality of spring-biased electrical contacts.

16. The electrical component of claim 15, further comprising a clamping element securing said at least one integrated circuit device to said first surface of said substrate and biasing said plurality of lead elements extending therefrom against said at least one array of spring-biased electrical contacts.

17. The electrical component of claim 15, wherein at least one spring-biased electrical contact of said plurality of spring-biased electrical contacts includes a permanent deflection.

18. The electrical component of claim 17, wherein said at least one spring-biased electrical contact is permanently deflected away from said first surface of said substrate.

19. The electrical component of claim 15, further comprising a plurality of vias disposed in said substrate, each via of said plurality of vias positioned at a location underlying one spring-biased electrical contact of said plurality of spring-biased electrical contacts.

20. The electrical component of claim 19, wherein at least one spring-biased electrical contact of said plurality of spring-biased electrical contacts is permanently deflected towards said first surface of said substrate and said via underlying said at least one spring-biased electrical contact.

21. The electrical component of claim 20, wherein a surface of said at least one spring-biased electrical contact and a wall of said underlying via substantially traps a lead element of said plurality of lead elements of said at least one integrated circuit device therebetween.

22. The electrical component of claim 15, wherein said each spring-biased electrical contact comprises a cantilevered spring, a transversely deflecting hoop-shaped spring, a spiral-shaped spring, or a rosette spring.

23. The electrical component of claim 15, wherein said each spring-biased electrical contact is configured to at least partially align a mating lead element of said plurality of lead elements of said at least one integrated circuit device relative thereto.

24. The electrical component of claim 15, wherein said each spring-biased electrical contact includes at least one contact element configured to remove or puncture through a layer of contaminants formed on a surface of a mating lead element of said plurality of lead elements of said at least one integrated circuit device.

25. The electrical component of claim 24, wherein said at least one contact element comprises a plurality of alternating grooves and ridges, at least one protrusion, or a roughened surface.

26. The electrical component of claim 15, further comprising:  
a second layer of resilient conductive material disposed over at least a portion of said second surface of said substrate;  
a second plurality of spring-biased electrical contacts formed in said second layer of resilient conductive material, each spring-biased electrical contact of said second plurality of spring-biased electrical contacts electrically isolated from said second layer of resilient conductive material by an aperture formed in said second layer of resilient conductive material;  
a second plurality of conductive traces formed in said second layer of resilient conductive material, at least a portion of said second plurality of conductive traces each terminating at one spring-biased electrical contact of said second plurality of spring-biased electrical contacts, each conductive trace of said second plurality of conductive traces electrically isolated from said second layer of resilient conductive material and all other conductive traces of said second plurality of conductive traces by at least one cavity; and  
at least one other integrated circuit device disposed on said second surface of said substrate, said second plurality of spring-biased electrical contacts on said second surface of said substrate arranged in at least one array corresponding to a footprint of a plurality of lead elements extending from said at least one other integrated circuit device, each lead element of said plurality of lead elements of said at least one other integrated circuit device biased against and electrically contacting one spring-biased electrical contact of said second plurality of spring-biased electrical contacts.

27. A method of fabricating a substrate assembly, comprising:  
providing a substrate having a first surface and an opposing second surface;  
forming a layer of resilient conductive material on at least a portion of at least one of said first and second surfaces of said substrate;  
forming at least one electrically isolated spring-biased electrical contact in said layer of resilient conductive material;  
forming at least one electrically isolated conductive trace in said layer of resilient conductive material, said at least one electrically isolated conductive trace having an end terminating at said at least electrically isolated spring-biased electrical contact; and  
treating said layer of resilient conductive material after said forming said at least one electrically isolated spring-biased electrical contact to achieve at least one desired physical characteristic of said layer of resilient conductive material.

28. The method of claim 27, wherein said forming a layer of resilient conductive material on at least a portion of at least one of said first and second surface of said substrate comprises:  
providing a laminate sheet of said resilient conductive material; and  
bonding said laminate sheet to said at least one of said first and second surfaces of said substrate.

29. The method of claim 28, wherein said bonding said laminate sheet to said at least one of said first and second surfaces of said substrate comprises adhering said laminate sheet to said at least one of said first and second surfaces of said substrate using an adhesive or bonding said laminate sheet to said at least one of said first and second surfaces of said substrate using a thermocompression bonding process.

30. The method of claim 27, wherein said forming a layer of resilient conductive material on at least a portion of at least one of said first and second surfaces of said substrate comprises forming said layer of resilient conductive material on said at least one of said first and second surfaces of said substrate using a deposition process.

31. The method of claim 30, wherein said deposition process comprises chemical vapor deposition or sputtering.

32. The method of claim 27, further comprising forming at least one via in said substrate, said at least one via underlying said at least one electrically isolated spring-biased electrical contact.

33. The method of claim 32, wherein said forming at least one via in said substrate further comprises forming a via opening only to said at least one of said first and second surfaces of said substrate.

34. The method of claim 27, further comprising preforming said at least one electrically isolated spring-biased electrical contact to include a permanent deflection.

35. The method of claim 27, further comprising forming at least one contact element on a surface of said at least one electrically isolated spring-biased electrical contact.

36. The method of claim 35, wherein said forming at least one contact element further comprises forming a plurality of alternating grooves and ridges, forming at least one protrusion, or forming a roughened surface.

37. The method of claim 36, wherein forming a plurality of alternating grooves and ridges, forming at least one protrusion or forming a roughened surface is effected by etching.

38. The method of claim 27, wherein said forming at least one electrically isolated spring-biased electrical contact in said layer of resilient conductive material comprises forming a cantilevered spring, forming a transversely deflecting hoop-shaped spring, forming a spiral-shaped spring, or forming a rosette spring.



39. The method of claim 27, wherein at least one of forming at least one electrically isolated spring-biased electrical contact in said layer of resilient conductive material and forming at least one electrically isolated conductive trace in said layer of resilient conductive material is effected by etching said layer of resilient conductive material.

40. A method of fabricating a substrate assembly, comprising:  
providing a substrate having a first surface and an opposing second surface;  
forming a layer of resilient conductive material on at least a portion of at least one of said first and second surfaces of said substrate, said resilient conductive material exhibiting at least one first physical characteristic;  
forming at least one electrically isolated spring-biased electrical contact in said layer of resilient conductive material;  
forming at least one electrically isolated conductive trace in said layer of resilient conductive material, said at least one electrically isolated conductive trace having an end terminating at said at least one electrically isolated spring-biased electrical contact; and  
treating said layer of resilient conductive material to achieve at least one second physical characteristic of said resilient conductive material.

41. The method of claim 40, wherein said at least one first physical characteristic is selected to optimize properties of said layer of resilient conductive material for said act of forming at least one electrically isolated spring-biased electrical contact therein.

42. The method of claim 40, wherein said at least one second physical characteristic is selected to optimize spring characteristics of said at least one electrically isolated spring-biased electrical contact.

43. The method of claim 40, wherein at least one of forming at least one electrically isolated spring-biased electrical contact in said layer of resilient conductive material and forming at least one electrically isolated conductive trace in said layer of resilient conductive material is effected by etching said layer of resilient conductive material.

44. The substrate assembly of claim 1, further including a dielectric layer overlying said layer of resilient conductive material and having apertures therethrough substantially aligned with said electrically isolated spring-biased electrical contacts.

45. The substrate assembly of claim 44, wherein the dielectric layer is of sufficient thickness to encompass at least a portion of each lead element of an integrated circuit device contacting an electrically isolated spring-biased electrical contact.

46. The substrate assembly of claim 45, wherein said apertures are of frustoconical configuration.

47. The substrate assembly of claim 3, further including a dielectric layer overlying said layer of resilient conductive material and having apertures therethrough substantially aligned with said electrically isolated spring-biased electrical contacts.

48. The substrate assembly of claim 47, wherein the dielectric layer is of sufficient thickness to encompass at least a portion of each lead element of an integrated circuit device contacting an electrically isolated spring-biased electrical contact.

49. The substrate assembly of claim 48, wherein said apertures are of frustoconical configuration.

50. The substrate assembly of claim 5, further including a dielectric layer overlying said layer of resilient conductive material and having at least one aperture therethrough substantially aligned with said at least one electrically isolated spring-biased electrical contact.

51. The substrate assembly of claim 50, wherein the dielectric layer is of sufficient thickness to encompass at least a portion of at least one lead element of an integrated circuit device contacting said at least one electrically isolated spring-biased electrical contact.

52. The substrate assembly of claim 51, wherein said at least one aperture is of frustoconical configuration.

53. The electrical component of claim 15, further including a dielectric layer overlying said layer of resilient conductive material and having apertures therethrough substantially aligned with said electrically isolated spring-biased electrical contacts.

54. The substrate assembly of claim 53, wherein the dielectric layer is of sufficient thickness to encompass at least a portion of each lead element of said at least one integrated circuit device contacting an electrically isolated spring-biased electrical contact.

55. The substrate assembly of claim 54, wherein said apertures are of frustoconical configuration.

56. The method of claim 27, further including disposing a dielectric layer overlying said layer of resilient conductive material, said dielectric layer being formed with at least one aperture therethrough substantially aligned with said at least one electrically isolated spring-biased electrical contact.

57. The method of claim 56, further comprising forming said dielectric layer to be of sufficient thickness to encompass at least a portion of each lead element of an integrated circuit device contacting said at least one electrically isolated spring-biased electrical contact.

58. The method of claim 58, further including forming said at least one aperture to be of frustoconical configuration.

59. The method of claim 56, further including preforming said dielectric layer with said at least one aperture prior to disposing said dielectric layer over said layer of resilient conductive material.

60. The method of claim 56, further including forming said dielectric layer in place over said layer of resilient conductive material and subsequently forming said at least one aperture therethrough.

61. The method of claim 40, further including disposing a dielectric layer over said layer of resilient conductive material, said dielectric layer being formed with at least one aperture therethrough substantially aligned with said at least one electrically isolated spring-biased electrical contact.

62. The method of claim 61, further comprising forming said dielectric layer to be of sufficient thickness to encompass at least a portion of each lead element of an integrated circuit device contacting said at least one electrically isolated spring-biased electrical contact.

63. The method of claim 62, further including forming said at least one aperture to be of frustoconical configuration.

64. The method of claim 61, further including preforming said dielectric layer with said at least one aperture prior to disposing said dielectric layer over said layer of resilient conductive material.

65. The method of claim 61, further including forming said dielectric layer in place over said layer of resilient conductive material and subsequently forming said at least one aperture therethrough.